REMARKS

Claims 1, 2, 4-6, 8-14, 17, 19-36, 38-77 and 83 are pending in the application. Claims 1-2, 4-6, 8-14, 17, 19-36, 38-77 and 83 are rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 0 631 805 (hereinafter "EP '805") in view of United States Patent 5,494,881 to Machida et al. (hereinafter "Machida") and United States Patent 4,335,023 to Dettling et al. (hereinafter "Dettling").

Applicants respectfully request reconsideration of the present application in view of the following Remarks.

Claims 1, 2, 4-6, 8-14, 17, 19-36, 38-77 and 83 and 35 U.S.C. § 103(a)

The rejection of claims 1, 2, 4-6, 8-14, 17, 19-36, 38-77 and 83 under 35 U.S.C. § 103(a) as being unpatentable over EP '805 in view of Machida and Dettling is respectfully traversed.

The prior art can be modified or combined to reject claims as prima facie obvious as long as there is a reasonable expectation of success. MPEP § 2143.02 (I). Moreover:

> Where claimed subject matter has been rejected as obvious in view of a combination of prior art references, a proper analysis under § 103 requires, inter alia, consideration of...whether the prior art would have also revealed that in so making or carrying out [the invention] those of ordinary skill in the art would have a reasonable expectation of success. [T]he reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

One of skill in the art would not have a reasonable expectation of success of modifying the catalytic body of EP '805 with the teachings of Machida and Dettling to arrive at a structural catalyst body of the present invention.

The catalyst bodies of Machida and Dettling are based solely on monolithic non-catalytic supports. Dettling, for example, recites:

> The present invention relates to catalysts of the type wherein a catalytically promoting component is distended upon a monolithic support member having a plurality of fluid flow channels.[1]

Moreover, Machida recites:

> The honeycomb structural body 10 may be an integrally extruded body consisting essentially of cordierite, mullite, alumina, silicon carbide, silicon nitride or zirconia....According to the present invention, when the honeycomb structural body 10 is used as a catalyst carrier, for example, the surface of the partition walls 12 is coated initially by a base material, such as γ-alumina or the like, by an amount of no less than 100 g/l with reference to a catalyst volume. Subsequently, a catalytic substance consisting essentially of at least one of noble metals among Pt, Rh and Pd is carried on the surface of the base material, by an amount of no less than 2 g/l with reference to the catalyst volume.[2]

In being based on monolithic non-catalytic supports, the mechanical properties, such as porosity and strength, of the catalyst bodies of Dettling and Machida are derived from and dependent on the monolithic non-catalytic supports. Dettling, for example, recites:

> The geometric surface area, including the surfaces of the fluid flow channels, of a typical monolithic carrier (assuming a smooth, nonporous surface) may be on the order of 0.001 to 0.01 square meters per gram. However, the actual surface area of the carrier, taking into account the porosity of the carrier material is usually many times greater, eg., 50 to 150 or more square meters per gram, so that much of the catalytic reaction will take place within the large pores. Preferably, the skeletal structure has a macropore distribution such that over 95% of the pore volume is provided by pores of a diameter of over 2,000 Angstroms, and over 5% of the pore volume is provided by pores having a diameter of over 20,000 Angstroms. For example, in one preferred embodiment, over 20% of the pore volume is provided by pores having a diameter of over 20,000 Angstroms. The total surface area, including the pores of the carrier, is preferably about 0.08 to 6 square meters per gram, preferably about 0.2 to 2 square meters per gram.

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[1] Dettling, Column 1, lines 7-10.
[2] Machida, Column 6, lines 50-52 and 58-66.

As set forth in the Office Action, however, EP '805 discloses a catalyst body formed from an extruded catalytically active composition.[3] The catalyst body of EP '805, therefore, does not comprise a monolithic non-catalytic support and cannot rely upon a monolithic non-catalytic support to provide advantageous mechanical properties, such as sufficient macroporosity and hydraulic diameter. As a result, one of skill in the art would not have a reasonable expectation of success of incorporating mechanical properties only provided by monolithic non-catalytic supports into a catalytic body precluding the use of such supports.

The previously submitted affidavits of Mr. DiFrancesco and Dr. Hastings confirm the assertion that one of skill in the art would not have a reasonable expectation of success of producing a non-supported catalyst body demonstrating mechanical properties only previously associated with supported structures. The following is an excerpt from the affidavits providing a mathematical analysis substantiating the lack of a reasonable expectation of success in producing a catalyst body of the present invention.

> As a result of the significant decrease in inner partition wall thickness and significant increase in macroporosity compared to Example 1, the pressure experienced on the bottom walls of a green (unfired) catalyst body of Example 2 increases from 554 kg/m^2 to 595 kg/m^2. Moreover, the pressure on the walls of a fired catalyst body of Example 2 at a compressive loading of 1.5 kg/cm^2 increases from 118,230 kg/m^2 to 153,133 kg/m^2 in comparison to Example 1, a 29.5% increase. Furthermore, as a result of wall thinning and increased macroporosity, the critical pressure to structural failure of the catalyst body of Example 2 decreases relative to that of Example 1. This is illustrated in the ratio of critical pressure for structural failure to minimum elastic modulus. The ratio of critical pressure for structural failure to minimum elastic modulus for the catalyst body of Example 2 is 0.47, a 43.3% decline from the same ratio for Example 1.

[3] Final Office Action mailed December 3, 2008, page 2.

> Significantly increasing the pressure experienced by the bottom walls of a green catalyst body while significantly decreasing the critical pressure to structural failure substantially increases the likelihood that the catalyst body will collapse under its own weight. This is especially true during handling and transport of the green catalyst body prior to firing. Moreover, significantly increasing the pressure experienced by substantially thinner inner partition walls of a fired catalyst body also increases the likelihood the catalyst body will fail when subjected to the harsh operational conditions of a catalytic reactor.
>
> Furthermore, the catalyst body of Example 2 exhibiting a hydraulic diameter of 151 mm provides additional distinction over prior art Example 1. As defined in the specification, hydraulic diameter is equal to the cross-sectional area perpendicular to the direction of flow of the catalyst body multiplied by four and divided by the value of the outer perimeter of the outer peripheral wall. From this definition, the hydraulic diameter characterizes the size of the catalyst body with larger hydraulic diameters equating to larger catalyst bodies.
>
> A hydraulic diameter of 151 mm is relatively large indicating a greater mass to support for the catalytic body of Example 2. As a result, a hydraulic diameter of 151 mm is inconsistent with the critical pressure to failure calculated for the catalyst body of Example 2. Based on the critical pressure to failure, the catalyst body of Example 2 should display a hydraulic diameter of 79 mm to prevent collapse of the catalyst body. The fact that the catalyst body of Example 2 displays a hydraulic diameter of 151 mm without collapse is a further indicia of non-obviousness. Moreover, based on the foregoing, even a hydraulic diameter of 100 mm coupled with an inner partition wall thickness less than 0.22 mm and a macroporosity greater than 0.05 cc/g is unexpected and, therefore, not contemplated by Example 1.[4]

The foregoing excerpt and mathematical analysis indicate that a non-supported catalytic body having the presently claimed mechanical properties would be expected to structurally fail. As a result, one of skill in the art would not have a reasonable expectation of success in producing such a non-supported catalyst body.

Furthermore, since Machida and Dettling only address catalyst bodies based on monolithic non-catalytic supports, Machida and Dettling fail to provide any disclosure regarding how to incorporate mechanical properties associated with monolithic non-

[4] Affidavits of Mr. DiFrancesco and Dr. Hastings pursuant to 37 C.F.R. § 1.132, pages 4-5 and 7.

catalytic supports into a catalytic body precluding the use of such supports. *See, Hybritech Inc. v. Monoclonal Antibodies, Inc.* 802 F.2d 1367, 231 USPQ 81 (Fed. Cir. 1986) (holding no reasonable expectation of success as invitation to try monoclonal antibodies in immunoassays based on prior art did not show obviousness since the prior art "did not suggest how that end might be accomplished.")

As provided in the previously submitted affidavits of Mr. DiFrancesco and Dr. Hastings, monolithic non-catalytic supports derive enhanced mechanical properties from processing conditions not available for catalytic compositions:

> [N]on-catalytic monolithic supports are processed under conditions which provide enhanced mechanical properties without consideration to affects on catalytic properties or catalytic performance. Non-catalytic supports, such as those described in Dettling and Machida, for example, may be sintered at high temperatures to increase strength of the non-catalytic support. Sintering at high temperatures is not available for catalytic materials since it will reduce or destroy surface area available for catalytic reaction.[5]

The inability to process catalytic materials of the present invention in a manner consistent with non-catalytic supports precludes Machida and Dettling from providing any teaching on how a non-supported catalyst body having mechanical properties only previously associated with supported structures "might be accomplished."

Moreover, the general formulas described by Machida do not provide an optimization route to catalyst bodies of the present invention since the formula are based on the provision of a non-catalytic monolithic support. Machida provides no teaching or disclosure that an unsupported catalyst body can be produced having properties falling with the parameters set forth by the formulas. Additionally, the formulas of Machida do not address the important structural properties of hydraulic diameter and macroporosity.

[5] Affidavit of Mr. DiFrancesco and Dr. Hastings pursuant to 37 C.F.R. § 1.132, submitted August 22, 2008, page 2.

The failure of the combination of EP '805, Dettling and Machida to provide a reasonable expectation of success precludes the combination from rendering the present claims unpatentable under § 103(a).

In addition to failing to provide a reasonable expectation of success, the combination of EP '805 with Machida and Dettling does not teach or suggest each and every limitation of the present claims. *See, In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) (holding to establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art). The combination of EP '805, Machida and Dettling fails to teach or suggest a catalyst body having a hydraulic diameter consistent with that presently claimed. As provided in the affidavits of Mr. DiFrancesco and Dr. Hastings, hydraulic diameter is an important structural property as it characterizes the size of the catalyst body with larger hydraulic diameters equating to larger catalyst bodies.[6] The failure of EP '805, Machida and Dettling to disclose a hydraulic diameter precludes the combination from rendering the present claims unpatentable under § 103(a).

Additionally, the combination of EP '805 with Dettling and Machida is improper as these references teach away from their combination. See MPEP § 2146 XD2, *In re Grasselli*, 713 F.2d 731, 218 USPQ 769 (Fed. Cir. 1983) (It is improper to combine references where the references teach away from their combination. The claimed catalyst which contained both iron and alkali metal was not suggested by the combination of a reference which taught the interchangeability of antimony with alkali metal combined with a reference excluding antimony from, and adding iron to, a catalyst). As recognized in the Office Action, EP '805 discloses a catalyst body excluding a monolithic non-catalytic support while Machida and Dettling disclose catalyst bodies based on such supports. EP '805's exclusion of a monolithic non-catalytic support teaches away from and precludes proper combination with the supported structures of Machida and Dettling.

In view of the foregoing, the combination of EP '805 with Machida and Dettling does not provide one of skill in the art a reasonable expectation of success in producing a catalyst body of the present invention. Moreover, the combination of EP '805, Machida

[6] Affidavit of Mr. DiFrancesco and Dr. Hastings pursuant to 37 C.F.R. § 1.132, submitted August 22, 2008, pages 4-5.

and Dettling fails to teach or suggest each and every limitation of the present claims. Furthermore, the combination of EP '805 with Machida and Dettling is improper. Applicants, therefore, respectfully assert the present claims are patentable over the combination of EP '805, Machida and Dettling and respectfully request that the present rejection be withdrawn.

Obviousness-Type Double Patenting

The provisional rejection of claims 1, 2, 4-6, 8-14, 17, 19-36, 38-77 and 83 on the ground of non-statutory obviousness-type double patenting over claims 1-28 of copending Application No. 11/122,261 is acknowledged. In the event the present claims are held allowable and the present rejection is maintained, Applicants will submit a terminal disclaimer.

CONCLUSION

In view of the foregoing, a favorable Office Action is respectfully solicited. The Examiner is respectfully invited to contact J. Clinton Wimbish at 704.338.5021 to discuss any matter related to the present application.

Respectfully submitted,

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Date

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